The Utility Concept of Net Social Cost--A Criterion for Public Policy

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AN OPTIMUM FARM POLICY is expected to meet many standards. Farmers want high income, consumers want low food cost, and taxpayers want low Treasury cost. Given the current economic structure of agriculture, these goals are mutually exclusive and lead to conflicts in formulating public policies. Higher farm income means higher food or Treasury cost; lower food cost means reduced farm income or increased Treasury cost; and lower Treasury cost means decreased farm income or expanded consumer food cost. Clearly a criterion for public policy that transcends these individual, narrow goals would be welcome.

In this paper we develop the utility concept of net social cost as a general criterion for policy. This criterion has many limitations to be discussed subsequently. It is a supplement, not a replacement for other criteria used to judge the desirability of specific programs.

Social cost has been used frequently by agricultural economists as a criterion for judging the merits of a particular farm commodity program, market structure, or resource allocation (4, 15, 18, 21, and 22).[1] The social cost concept has been viewed as the net value of goods and services foregone by producing either too much or too little of a particular commodity. The concept cannot be defended on the simplified ground that more of a good (or service) is preferred to less, because too much of any particular commodity can be undesirable. It may be defended on the ground that a larger "basket" of goods and services is preferred to a smaller one, but then aggregation problems emerge. The need arises to compare the worth of having more of one versus another commodity. In this and other ways, social cost involves interpersonal and intercommodity measures of value. These measures are cardinal, and, we believe, entail the implicit assumption that a low social cost has more utility than a high social cost, even where the concept is expressed in dollars. We proceed on this premise, that the social cost concept is implicitly and fundamentally tied to cardinal utility measures.

A review of numerous writings has not uncovered an adequate exposition of the relationship between utility of individuals and the social cost concept derived from industry demand and supply (1-3, 5-14, 16, 17). This paper is at least a partial effort to alleviate the confusion which surrounds the use of industry demand and supply to measure social cost, and the relationship of social cost to utility of consumers.

The concept of social cost developed here may be criticized as a "regression" to Benthamite notions of cardinal utility measurement. Following Pareto and the principle of "Occam's razor" (economy in use of assumptions to reach a given conclusion), the modern trend has been to deemphasize cardinal measures in favor of ordinal measures of utility (cf. 17). Perhaps the trend has gone too far.

The analysis is methodological, intended to illustrate the assumptions and possible uses and limitations of cardinal utility as a pedagogic device and as an added criterion for public policy. The next section, a mathematical development of the utility concept, is followed by an empirical application to the U.S. wheat market.

Social Cost Criterion

The concept of social benefit is developed from individual consumer utility functions. Consider for a single consumer a domain of two commodities, q_1 and q_2, selling at constant prices P_1 and P_2, respectively. Given the utility function (1) associated with consumption of the two goods, the consumer's welfare function U^* is specified as (2).

[1] Underscored numbers in parentheses refer to items in the Literature Cited, p. 41.

(1) $U = U(q_1, q_2)$

(2) $U^* = U(q_1, q_2) + \lambda(Y_0 - P_1 q_1 - P_2 q_2)$

The welfare function specifies total utility subject to the income restraint $Y_0 = P_1 q_1 + P_2 q_2$ and with λ a Lagrangian multiplier.[2] To maximize utility, the derivatives with respect to q_1, q_2, and λ are computed and set equal to zero in (3) to (5):

$$(3) \qquad \frac{\partial U^*}{\partial q_1} = \frac{\partial U}{\partial q_1} - \lambda P_1 = 0$$

$$(4) \qquad \frac{\partial U^*}{\partial q_2} = \frac{\partial U}{\partial q_2} - \lambda P_2 = 0$$

$$(5) \qquad \frac{\partial U^*}{\partial \lambda} = Y_0 - P_1 q_1 - P_2 q_2 = 0$$

If (1) were an explicit utility function, the marginal utilities in (3) and (4) would be specified and (3), (4), and (5) could be solved for λ and the utility-maximizing levels of q_1 and q_2 (5).

The total derivative of (1) with respect to q_1 and q_2 gives the following:

$$(6) \qquad \frac{dU}{dq_1} = \frac{\partial U}{\partial q_1} + \frac{\partial U}{\partial q_2}\frac{dq_2}{dq_1}$$

$$(7) \qquad \frac{dU}{dq_2} = \frac{\partial U}{\partial q_2} + \frac{\partial U}{\partial q_1}\frac{dq_1}{dq_2}$$

The first right-hand term is the direct marginal utility, and the second is indirect marginal utility derived from changing consumption of the other good. Assuming that the marginal utility of q_1 is independent of q_2 and the marginal utility of q_2 is independent of q_1, the second right-hand terms in (6) and (7) drop out, and (3) and (4), without being solved simultaneously, may be specified as:

$$(8) \qquad \frac{dU}{dq_1} = \lambda P_1, \text{ and}$$

$$(9) \qquad \frac{dU}{dq_2} = \lambda P_2.$$

Assume that the marginal utility of money λ is constant and arbitrarily assigned a value $\lambda = 1$. Constant utility of money units is likely to be approached only for small changes in consumption of q_1 or q_2, or if the commodity in question (q_1 for our purposes) represents a small part of the consumer's purchases. Given these assumptions, the marginal utility of consuming q_1 is measured by its price, i.e.:

$$(10) \qquad \frac{dU}{dq_1} = P_1 \text{ or } dU = P_1 dq_1$$

The demand function (11) is formed by solving (3) to (5) for q_1.

$$(11) \qquad q_1 = D(P_1) \text{ or } P_1 = D^{-1}(q_1)$$

The demand quantity is a function of price P_1 (with P_2 and Y_0 fixed) as specified by the demand function (11). Substituting (11) for the demand price P_1 in (10), the integral from 0 to n is the total utility (12) from consuming n units of q_1.

$$(12) \qquad U = \int_0^n D^{-1}(q_1) dq_1$$

Since (11) becomes a marginal utility curve under the stated assumptions, the integral (12) measures total utility and is the area underneath the demand curve. The integral can be formed only if the demand function is continuously defined and touches the price axis. The assumption that price (and marginal utility) is finite even for a quantity approaching zero seems reasonable, especially if q_1 is not a necessity and if substitutes exist. Since the total utility from consuming q_1 is measured by the area beneath the demand curve from $q_1 = 0$ to $q_1 = n$, as n becomes larger the entire area beneath the consumer demand curve is included.

Equation (12) can be aggregated over all consumers to form the total demand and utility functions for q_1 if, for each consumer, the marginal utility of a given quantity of q_1 is independent of the quantities consumed by others (absence of external economies or diseconomies in consumption). If the independence condition is satisfied, and λ is homogeneous for all consumers, then the area beneath the market demand curve is a measure of utility gained or total social benefit from consuming q_1.

Consumption of q_1 not only gives direct utility measured by (12), but also involves a cost of

[2] Income can be regarded as the flow of goods and services from assets (resources) over a specified period with the asset position remaining the same at the end as the beginning of the period. Hence consumer utility is maximized subject to the asset or resource distribution.

utility foregone by consuming q_1 rather than other commodities represented by q_2. To determine the utility foregone, it is necessary to specify a production function (13) for outputs q_1 and q_2 from the variable input x.[3] The private cost for a firm is the resource price P_x multiplied by the quantity, or $P_x x$. The firm profit π in (14) is maximized by equating derivatives of the expression (15) to zero in (16) to (19). The Lagrangian multiplier is designated as μ. Equations (13) to (19) are:

$$(13) \quad F(q_1, q_2, x) = 0$$

$$(14) \quad \pi = P_1 q_1 + P_2 q_2 - P_x x$$

$$(15) \quad \pi^* = P_1 q_1 + P_2 q_2 - P_x x + \mu F(q_1, q_2, x)$$

$$(16) \quad \frac{\partial \pi^*}{\partial q_1} = P_1 + \mu \frac{\partial F}{\partial q_1} = 0$$

$$(17) \quad \frac{\partial \pi^*}{\partial q_2} = P_2 + \mu \frac{\partial F}{\partial q_2} = 0$$

$$(18) \quad \frac{\partial \pi^*}{\partial x} = -P_x + \mu \frac{\partial F}{\partial x} = 0$$

$$(19) \quad \frac{\partial \pi^*}{\partial \mu} = F(q_1, q_2, x) = 0$$

Rearranging terms and dividing (16) by (17), (18) by (16), and (18) by (17), the respective results are (20), (21), and (22):

$$(20) \quad -\frac{dq_2}{dq_1} = \frac{P_1}{P_2}, \text{ or } P_1 = -\frac{dq_2}{dq_1} P_2$$

$$(21) \quad \frac{dq_1}{dx} = \frac{P_x}{P_1}, \text{ or } P_1 = \frac{dx}{dq_1} P_x$$

$$(22) \quad \frac{dq_2}{dx} = \frac{P_x}{P_2}, \text{ or } P_2 = \frac{dx}{dq_2} P_x$$

Equations (20) and (21) are two expressions of q_1 cost. Expression (21) indicates that P_1 is equal to the direct private cost of a small increment in q_1. $P_x dx$ is the increment in total cost associated with dq_1, hence $P_x dx\ dq$ is the marginal cost. It is apparent that the supply price P_1 in the firm supply function may then be regarded as a measure of marginal cost.

P_1 viewed from the production or firm side in (20) is a measure of the opportunity cost or value of production (and consumption) foregone by producing additional q_1. The amount of production foregone dq_2 divided by an increment dq_1 and multiplied by the price P_2 is the value of production sacrificed. The two expressions of cost $-\frac{dq_2}{dq_1} P_2$ and $\frac{dx}{dq_1} P_x$ are equal.

Again assuming the marginal utility of money is unity ($\lambda = 1$), from (9) we derive $P_2 = dU/dq_2$. This expression for the marginal utility of q_2 is inserted into (20) giving:

$$(23) \quad P_1 = -\frac{dq_2}{dq_1}\frac{dU}{dq_2} = -\frac{dU}{dq_1}, \text{ or } dU = -P_1 dq_1$$

The relationship between supply price and quantity is specified by the supply function (24), found by solving (16) to (19) for q_1:

$$(24) \quad q_1 = S(P_1), \text{ or } P_1 = S^{-1}(q_1)$$

After substituting (24) for P_1 in (23), the total utility foregone by production and consumption of q_1 is specified in (25) by integrating (23) over the range 0 to n:

$$(25) \quad U = -\int_0^n S^{-1}(q_1)dq_1$$

The integral is the area beneath the individual firm supply curve. It is a valid measure of total utility foregone only if the marginal utility of money is constant, the marginal cost curve is continuously defined, and there is no divergence between social and private cost.

Under competitive conditions and excluding external economies or diseconomies of scale in production,[4] the individual firm marginal

[3]Resources designated x are variable in the length of run considered. Other fixed resources will influence the productivity coefficients, hence the resulting marginal conditions and utility are subject to the initial distribution of assets in both production and consumption.

[4]Some costs are external to the firm but internal to the industry. In the long run, many such costs are reflected in private accounts of the firm. More important is the dissassociation between private and social costs (or returns) that do not become reflected in private accounts of the firm even as the length of run increases.

cost (supply) functions can be aggregated to form the industry supply curve. The area beneath the industry supply function is a measure of the total utility foregone or opportunity cost of producing and consuming q_1 rather than q_2 under the conditions stated above.

The total utility U_T or net social gain from consumption and production of q_1 is the sum of the direct utility (12) and the utility foregone (25), i.e., (26):

$$(26)\quad U_T = \int_0^N D^{-1}(Q_1)dQ_1 - \int_0^N S^{-1}(Q_1)dQ_1$$

where Q_1 and N designate industry demand and supply relationships. To maximize U_T, we take the derivative with respect to Q_1 in (26) and set it equal to zero. The solution is the quantity at which the supply price and demand price (marginal utilities) are equal. That is, q_1 increases until the satisfactions achieved from consuming it just equal the satisfactions foregone by not consuming other commodities represented by q_2. Since this occurs only at the intersection of supply and demand, it follows that prices and quantities under perfect competition maximize utility, subject to the initial resource distribution.

Additional assumptions are that knowledge is complete, products and resources are mobile, and second-order conditions of convexity, etc., are met. Given these conditions, the equilibrium specified from (26) with price P_1 and P_2 represents a Pareto optimum.

Dividing (8) by (9), the result (27) is equivalent to (20):

$$(27)\quad -\frac{dq_2}{dq_1} = \frac{P_1}{P_2}$$

The marginal rate of substitution of q_1 for q_2 in production for all firms and in consumption for all consumers equals the same price ratio, thus they are equal to each other--a necessary condition for a Pareto optimum.

A two-commodity world of q_1 and all other commodities denoted by q_2 was considered above to simplify and shorten the analysis, but the results also apply when a larger group of commodities is included.

ADDITIONAL ASSUMPTIONS

Figure 1 illustrates the concepts developed mathematically. D is industry market demand; S is industry supply. Gross social benefit is the area beneath D; gross social cost (variable cost) is the area beneath S. Gross social benefit less social cost is the net social gain, i.e., the sum of areas A, r, s, t, and u. Net social gain is divided into two portions: consumer surplus, i.e., the area s, r, and part of A above p_e; and producer surplus (profit), i.e., area t, u, and part of A below p_e. The net social cost c: utility foregone by underproducing at q_a rather than the competitive equilibrium q_e is measured by the triangle A. The net social cost of overproduction at q_b is triangle B.

The concept of net social cost may become more clear with an intuitive argument. At any given wheat quantity, the vertical distance from the quantity axis to the demand curve is one measure of the social benefits of that quantity, and the distance to the supply curve is one measure of the social cost. It follows that the difference between these vertical segments, the distance between the demand and supply curves, is one measure of the net social gain from producing and consuming the particular quantity

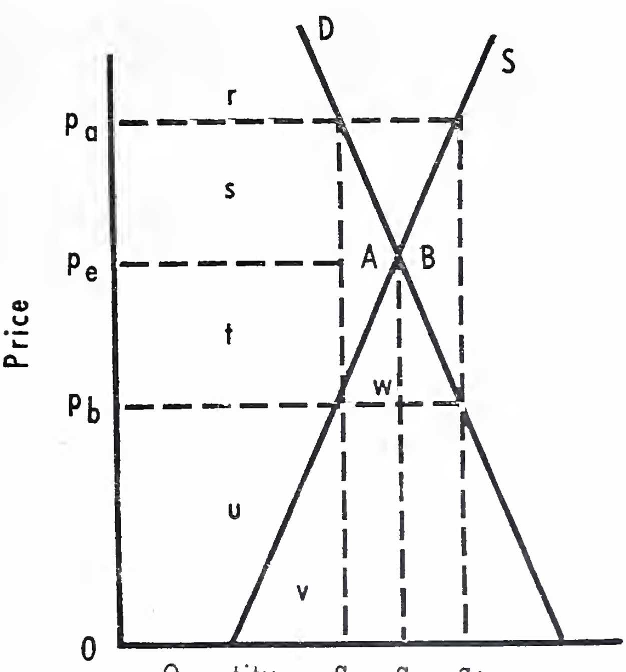

Figure 1.--Hypothetical illustration of the social cost concept.

of (say) wheat. If we sum the net social gains for each bushel of wheat, the area between the supply and demand curves is traced. Positive additions to social gain are made by moving to the right until supply and demand intersect. This is the equilibrium output in a "free" market, unrestricted by production controls and price supports. It follows that the equilibrium price and quantity established in free markets maximize the net social gain, given the initial resource distribution. Competitive equilibrium is a "local" utility maximization or Pareto optimum on a contract curve.[5] Movement along the contract curve to a "global" utility maximum requires a redistribution of income or resources, based on value judgments and generally resolved through voting or other social mechanisms.

Sometimes, net social gain might be judged to be divided inequitably between producer surplus and consumer surplus. In that event it may be argued that, since the equilibrium price and quantity (at the intersection of supply and demand) represent the largest "pie" of utility available, consumers can compensate producers adequately and still have more "pie" than at any other output. Further, the free market equilibrium output may represent the most acceptable output and resource return for producers and consumers alike simply because it arises from an impersonal pricing mechanism which society may prize for rewarding factors according to their contribution.

The applicability of this argument for agriculture has been questioned, particularly in regard to the following conditions: (a) the initial distribution of assets, (b) transferability of resources to alternative uses with a minimum of cost, time, and friction, and (c) the degree to which decision-makers are informed about returns to resources in alternative uses. If some farmers are poorly endowed with resources at the outset, free markets may not allow them to accumulate a socially acceptable income in a reasonable period. Labor in an industry sometimes receives depressed earnings because of an inelastic demand coupled with demand contraction or supply expansion. If institutional and psychological restraints delay the transfer of labor to more lucrative employment, returns may be depressed over extended periods. Price and output at the intersection of supply and demand in such an industry need not maximize national welfare. Some believe that agriculture is such an industry, in which welfare or satisfaction is not necessarily maximized by the output and prices resulting from the intersection of demand and supply without Government regulation of the market.

Another assumption of the mathematical development of net social cost is absence of external economies or diseconomies of scale. This assumption may be quite innocuous in the wheat example presented later but can be very important in other applications.

Perhaps the most serious limitation arises in the application of the net social cost concept to farm programs requiring sizable Government transfer payments to farmers. These may be regarded as transfers of consumer surplus to producers in compensation for an unacceptably low producer income. In fact, however, it is not consumers of the specific commodity but all taxpayers who provide the transfer payment.

The public may judge that the sum of the areas A, r, s, t, and u to the left of demand and supply in figure 1 (the total potential net gain) is divided inequitably between farmers and consumers, and a program to redistribute the net social gain is initiated. Taxes or output restrictions redistributing income to farmers change output from q_e to q_a or q_b. The expense for personnel and equipment to administer the program is likely to be a social cost. The tax and subsidy may represent a social cost to the extent that the marginal utility of money is higher among taxpayers than among farmers. If marginal utilities of money are equal for taxpayers and farmers, then the social cost of a program that redistributes income by transfer payments through the U.S. Treasury will be small, providing output does not deviate appreciably from q_e. The fact that the income redistribution is approved by society may imply a higher marginal utility of money to farmers than to taxpayers--hence a conceivable utility gain from a tax-subsidy program. The subsequent discussion abstracts from measuring the social gain or loss from Government expenditures because of obvious measurement problems.

[5] For definition of the contract curve see Melvin Reder (16, p. 23).

National programs to redistribute income can shift the industry demand curve and, more likely, the supply curve. Farmers invest income supports in capital improvements and improved technology (21). The result may increase supply and bid resources away from uses more favored by society, thereby reducing utility. But purchase of capital representing improved technology may increase productivity and aggregate utility. The net effect on utility is unknown.

The exact validity of the social cost concept discussed above also requires equilibrium in perfectly competitive markets for all commodities for a fixed level of q_1. Given equilibrium in nonperfect markets for commodities other than q_1 (as for agriculture vis-a-vis other economic sectors), the net social cost in figure 1 for q_1 will remain essentially valid, representing maximum net utility attainable under the given structure. It is clear that the net social gain concept must be used with caution. Relevance depends partially on the commodity being examined.

Application of Social Cost Concept to Wheat Programs

The purpose of this paper is to examine the social cost concept, and not to analyze the wheat market structure. Thus little background is given on wheat markets and implications of alternative wheat programs (19 and 20). The following estimates do, however, give some insight into the social cost of several wheat programs (designated I to XI in this paper) that are current contenders in the policy milieu. Social cost is the area A or B in figure 1. It is here measured in dollars of goods foregone because of a nonoptimum output, but it could be assigned a utility index by setting a value (say, one dollar equals one unit of utility) as the marginal utility of money λ.

Programs in table 1 are characterized by low Government cost. Net farm income is increased above the free market level by exercise of monopoly control of wheat production and market allocation to maximize net farm income.

FREE MARKET

Without supply controls or Government price and income support, the equilibrium wheat price is $1.20, production 1,480 million bushels. Net income to farmers is $787 million, and social cost is low.

Table 1.--Wheat industry pricing and market allocation under competitive (unrestricted) and supply control (monopoly) market structures[1]

Item	Free market (unrestricted, production program I)	Supply control or monopoly		
		One-price program (II)[2]	Two-price program (III)[3]	Three-price program (IV)[4]
Food, Seed, Industry:				
Price................dol./bu..	1.20	1.25	2.00	2.00
Quantity.............mil. bu..	565	563	545	545
Returns.............mil. dol..	681	704	1,090	1,090
Feed:				
Price................dol./bu..	1.20	1.25	1.22	1.19
Quantity.............mil. bu..	135	94	119	144
Returns.............mil. dol..	163	118	145	172
Exports:				
Price................dol./bu..	1.20	1.25	1.22	1.23
Quantity.............mil. bu..	780	643	724	699
Returns.............mil. dol..	939	804	885	860
Gross wheat receipts...mil. dol..	1,733	1,620	2,120	2,122
Total production cost..mil. dol..	996	801	891	891
Net farm returns.......mil. dol..	[5] 787	819	1,229	1,231
Total quantity..........mil. bu..	1,480	1,296	1,388	1,388
Planted acres........... mil..	[5] 66.3	53.4	59.4	59.4
Yield per planted acre.......bu..	22.3	24.2	23.4	23.4
Social cost...........mil. dol..	0	26	14	15

[1] Prices, output, costs, and returns are at the farm level. Totals may not be exact because of rounding.
[2] The equilibrium quantity is determined by equating the marginal revenue computed from the aggregate demand function, with marginal cost (supply). The individual market allocation is found by computing the demand quantity in each market at the price $1.25.
[3] The equilibrium quantity is determined by summing the two marginal revenue curves of (a) the domestic food, seed, and industry market, and (b) the feed and foreign export market, and equating the combined function to marginal cost (supply). The equilibrium marginal revenue is related back to the component demand, with the price and quantity in each major market specified by the equilibrium marginal revenue.
[4] The same procedure as in footnote 3, but with 3 markets.
[5] Some of the wheat production with free markets may simply replace feed grain with little change in net returns on acres where this substitution occurs. If 60 million acres is the effective acreage, excluding substitutions, the net return under free markets is $706 million.

MULTIPLE PRICE PROGRAMS

Net farm income is not much greater under the one-price monopoly program than under the free market because of the highly elastic total demand for wheat at low prices when wheat becomes competitive with feed grains at home and abroad. We arbitrarily specify under all wheat programs that the domestic food wheat price can be no higher than $2 per bushel. Social cost of the one-price plan is high ($26 million) compared to other programs in table 1 because considerable consumer surplus potential is foregone in feed wheat and export markets at $1.25 per bushel.

Net farm income is considerably enhanced under the two-price plan, where the domestic food, seed, and industry market is separated

from the feed and export market. Social cost is $14 million, or approximately half the social cost of the one-price plan. Where demand is considerably elastic, as for wheat in the feed and export markets, a small increase in price substantially raises the social cost.

There appear to be few advantages to the three-price plan over the two-price plan, according to table 1. Income is a little higher. Social cost is up only slightly, but administration and other problems of separating the three markets would probably rule out the program.

DIRECT PAYMENTS

Voluntary programs involving Government supports are compared in table 2 with the two-price monopoly program. To facilitate comparisons, all programs are adjusted to give the same net farm income as program III. Programs are defined more fully in table 2 footnotes which refer to Government cost assumptions illustrated in figures 2 and 3. Under the direct payment program V, pricing and output are the same as under the free market. Direct income supplements are used to raise net farm income from wheat to the prescribed $1,229 million.

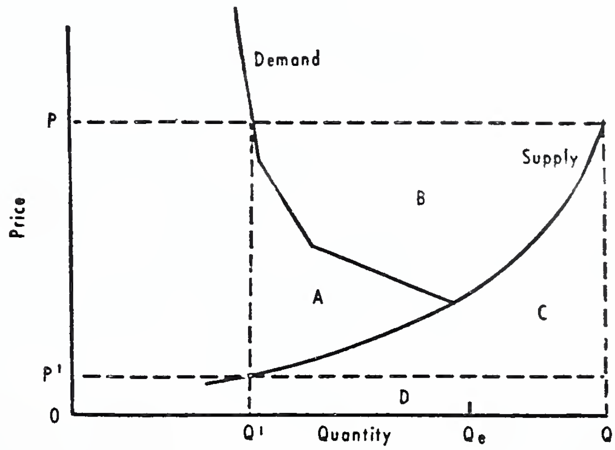

Figure 2.--Hypothetical examples of Government costs with voluntary acreage diversion programs operated at different levels of efficiency.

Table 2.--Implications of selected programs in achieving a prescribed net farm income from wheat of $1,229 million

Item	Supply control--two-price plan (III)[1]	Voluntary programs							
		Direct payment-lump sum (V)[2]	Acreage diversion		Market subsidies				
					Allotments		No allotments		
			Efficient (VI)[3]	Less efficient (VII)[4]	Efficient (VIII)[5]	Less efficient (IX)[6]	Efficient (X)[7]	Less efficient (XI)[8]
Price....................dol./bu..	1.22-2.00	1.20	1.73	1.28	1.50	1.50	1.49	1.49
Quantity.................mil. bu..	1,388	1,480	703	1,184	1,480	1,480	1,570	1,570
Market returns...........mil. dol..	2,120	1,783	1,212	1,519	2,225	2,225	2,340	2,340
Government payments......mil. dol..	--	442	386	414	[9] 50	[9] 232	[9] 166	[9] 271
Gross returns..........mil. dol..	2,120	2,225	1,598	1,933	2,225	2,225	2,340	2,340
Total nonland cost.......mil. dol..	891	996	369	704	996	996	1,111	1,111
Net farm returns.......mil. dol..	1,229	1,229	1,229	1,229	1,229	1,229	1,229	1,229
Planted acres...............mil...	59.4	66.3	24.6	46.9	66.3	66.3	74.3	74.3
Yield per planted acre.........bu..	23.4	22.3	28.6	25.2	22.3	22.3	21.1	21.1
Treasury cost [10].........mil. dol..	Small	442	386	414	50	232	116	271
Income increment above free market per unit Treasury cost.........................dol..	Large	1.00	1.15	1.07	8.84	1.91	2.66	1.63
Social cost.............mil. dol..	14	Small	386	75	Small	Small	8	8

[1] See the two-price plan, table 1. Throughout the table, data may not be exact because of rounding.
[2] The difference between the free market equilibrium in table 2 and the prescribed income is made up by a direct payment to farmers. This payment must be independent of future production or equilibrium prices and quantities will change as well as other implications above.
[3] Through market and production contract discrimination, the Government cost is assumed to be area A, figure 2.
[4] More realistic than the "efficient" program, Government cost is area ABCD, figure 2.
[5] Allotments are at the free market level, 66.3 million acres. Government cost is A, figure 3. The Government cost or subsidy is not paid directly to farmers, but is included indirectly in market receipts.
[6] Government costs are AC in figure 3 with $Q = Q_e$.
[7] Government cost is A, figure 3.
[8] Government cost is ABC, figure 3.
[9] The Government costs are included in farm receipts, thus need not be added as in other cases to gross farm returns.
[10] Does not include administration and storage cost.

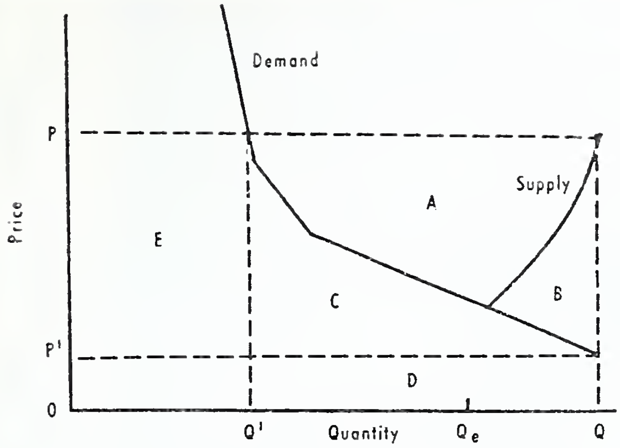

Figure 3.--Hypothetical examples of Government costs with market subsidy programs operated at different levels of efficiency.

Assuming that payments can be independent of expected price and other inducements that would change output from the free market level, the social cost of program V is nominal. Payments could be tied to past allotment history, the farm, or individuals. Whether these payment schemes would in fact leave output at the free market equilibrium is questionable, however.

ACREAGE DIVERSION

Acreage diversion programs have been used to control feed grain production in recent years, and have been used to a small extent for wheat. Under acreage diversion programs, the Government pays farmers to remove land from wheat production--to convert part of their wheat allotment to soil conserving uses. Program VI shows that if the Government uses sealed bids and other means to administer the program efficiently[6] and make each Government dollar go far in raising farm income with an acreage diversion program, the social cost is very high. The reason is that production must be curtailed severely before the quantity is cut from the elastic portion of the wheat market (below about $1.40 per bushel) to the inelastic domestic food portion of the demand. The acreage diversion program VI alone does not appear to be acceptable for maintaining wheat prices at a high level.

If the Government administers the program less efficiently, with greater transfer payments per unit of production removed, the income supplement from Government payments helps raise farm income with less acreage cutback under VII than under VI. Because wheat is priced competitively with feed grains, program VII could be combined in a joint feed grain-wheat program. Social cost is $75 million--somewhat greater than under the multiple price programs in table 1.

MARKET SUBSIDY

Market subsidy programs require a subsidy equal to the difference between the market support price and the demand price. Given supply and demand, the extent to which markets are discriminated determines the subsidy required. Market subsidy programs can be administered by issuing Government subsidies to exporters as necessary to move desired quantities, or the Government can first purchase quantities in excess of market needs at the desired support price, then export the excess at whatever terms are feasible.

Prices supported above competitive equilibrium encourage overproduction. Income advantages of market subsidies over free markets might be used as incentives for farmers to minimize social cost by restricting output to the free market level (programs VIII and IX, table 2). With full market discrimination, paying a subsidy equal to the difference between the support price and the demand price on each bushel, Government cost could be as low as $50 million. In practice, this is not possible. A subsidy on all bushels (except domestic food) equal to the difference between the support and demand price on the last bushel would result in a more realistic level of Government cost, $232 million in program IX.

Without allotments, farmers would produce an estimated 1,570 million bushels on 74.3

[6] Here the terms "efficient" and "inefficient" do not refer to waste or mismanagement in administering programs, but rather to the extent of efforts to pay individual producers the minimum required to curtail production or pay individual processors the minimum subsidy between market support price and demand price for utilizing wheat. The decision to administer the program without sealed bids and market discrimination may be a conscious and planned effort to avoid friction and ease administration problems.

million acres at the $1.49 support price. Again with perfect market discrimination, Government cost would be $166 million in program X, social cost only $8 million. Social cost remains unchanged but Government costs are raised to $271 million with the same subsidy paid on all wheat (except domestic food) in program XI. Government cost would be $487 million if the difference of $0.31 between the support price ($1.49) and the demand price ($1.18) were paid on all production, including that utilized in domestic food markets. But assuming that the large Government transfer payments from taxpayers to farmers were between individuals with the same marginal utility of money, social cost would be the same in programs X and XI.

SUMMARY AND CONCLUSIONS

Programs to restrict output such as supply control and acreage diversion involve the greatest social cost. Of programs designed to provide wheat farmers with $1,229 million net income, direct payments, market subsidies, supply control (two-price monopoly), and acreage diversion programs rank from lowest to highest in social cost. In general, however, social cost is not large in relation to net farm income. Social cost, as a proportion of net farm income, is only 6.1 percent for acreage diversion program VII, 1.1 percent for supply control program III, and 0.7 percent for market subsidy programs X and XI. It is apparent that supply control programs such as III could involve greater social cost than some Government programs.

Social costs of redistributing income to producers tend to be low if demand is either perfectly elastic or perfectly inelastic. Social cost of a two-price plan even with a sizable redistribution of income is not large with a combination of a highly inelastic demand (domestic food) and a highly elastic export and feed demand. Allocation to the domestic food market is not changed markedly from the free market because quantity is not responsive to the higher price--hence social cost is small. Marginal revenue in the feed-export market approaches the nearly horizontal demand curve--thus the intersection of the marginal revenue curve (monopoly) and the demand curve (competitive) with the supply curve occurs at nearly the same output, especially if the supply curve is steep.

The social cost is sensitive to the export demand specification. For example, when the export demand curve is made to fall twice as fast as that used in tables 1 and 2, social cost is increased respectively to $82, $33, and $35 million for programs II, III, and IV.[7]

In conclusion, the concept of social cost in this study appears promising for some uses but has limitations. The application to wheat markets is not exact because assumptions are violated and estimating techniques are imperfect. But we believe the concept does give useful insight into utility foregone by over- or under-extending output. The criterion supplements but does not replace estimates of farm income, Government cost, consumer cost, freedom in production and marketing, and income increments per Government dollar in appraising policy alternatives.

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7 Unfortunately, lack of space precludes discussion of the many qualifications and limitations on the demand and supply estimates. The reader is again referred to Tweeten (19).

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